Water Policy Interim Committee
September 10, 2018
Data Use and Modeling in DNRC stream flow analyses
Handout

Analytical models

Homogeneous, simple geometry, 1 stream

Model References

Model Name	Link
Groundwater Permit or Change Criteria	
AQTESOLV®	http://www.aqtesolv.com/
Stream Depletion or Mitigation Evaluations	
Well Pumping Depletion Model® (WPDM)	http://westernwaterconsulting.com/WPDM.htm
Alluvial Water Accounting System® (AWAS)	http://www.ids.colostate.edu/projects.php?project=awas
Return Flow Evaluations	
Stream Accretion Model® (SAM)	http://westernwaterconsulting.com/SAM.htm

Superposition numerical model

Homogenous, complex geometry, multiple streams

Calibrated numerical models

Variable properties, complex geometry, multiple streams

Model References

Model Name	Link
MODFLOW®	https://water.usgs.gov/ogw/modflow/MODFLOW.html

Surface Water (SW) Models

Model Name	Link
USGS Streamstats®	https://water.usgs.gov/osw/streamstats/
USGS PRMS®	https://wwwbrr.cr.usgs.gov/projects/SW_MoWS/PRMS.html
HEC-HMS®	http://www.hec.usace.army.mil/software/hec-hms/
Thornthwaite Water Balance®	https://wwwbrr.cr.usgs.gov/projects/SW_MoWS/

Other SW model references	http://dnrc.mt.gov/divisions/water/water-rights/new-appropriations-program/water-availability-references

Determining an assumed monthly pumping or consumption schedule

Program	Link
Irrigation Water Requirement (IWR)	http://www.nrcs.usda.gov

Glossary

Groundwater Drawdown or Cone of Depression – Result of removal (e.g., pumping or flow from a well or spring) of water from an aquifer and will propagate though the aquifer based on aquifer properties (e.g., dependent on T and S_y, but independent of hydraulic gradient) and location of boundaries (eg., surface water and no-flow boundaries)

Transmissivity (T) – the capacity of the full thickness of an aquifer to transmit water per unit width and unit gradient.

Specific Yield (S_y) – measure of the amount of water released from or taken into storage in an unconfined aquifer in response to lowering or raising of the water table.

Hydraulic Gradient – change in groundwater level per unit distance in the direction of groundwater flow.

Groundwater Mound – increase in the elevation of a water table that results from injection of water into the aquifer (e.g., mitigation) or downward percolation of water applied for irrigation but not consumed (e.g., return flows).

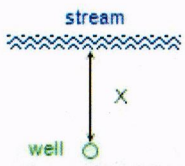
Net Irrigation Requirement (NIR) – Calculated irrigation required for optimum crop growth.

Well Pumping Depletion Model (WPDM)

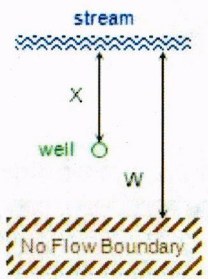
1. Enter Project Description:

2. Select One of the Following Four Aquifer Options:

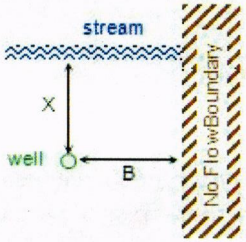
Option No. 1



Option No. 2



Option No. 3



Option No. 4

Boundary affects approximated by use of an effective stream depletion factor (sdf).

Option No. 1

3. Enter Physical Characteristics:

Clear Data: Click to Clear Data

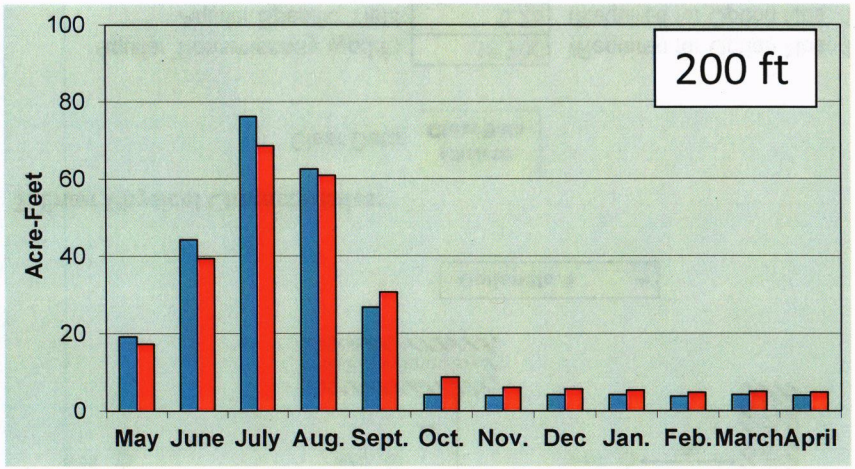
Aquifer Transmissivity (gpd/ft):	18,700	(Required for Option Nos. 1, 2, or 3 only)
Aquifer Specific Yield:	0.25	(Required for Option Nos. 1, 2, or 3 only)
Distance X (feet):	1,000	(Required for Option Nos. 1, 2, or 3 only)
Distance W (feet):		(Option No. 2 only)
Distance B (feet):		(Option No. 3 only)
sdf:		(Option No. 4 only)

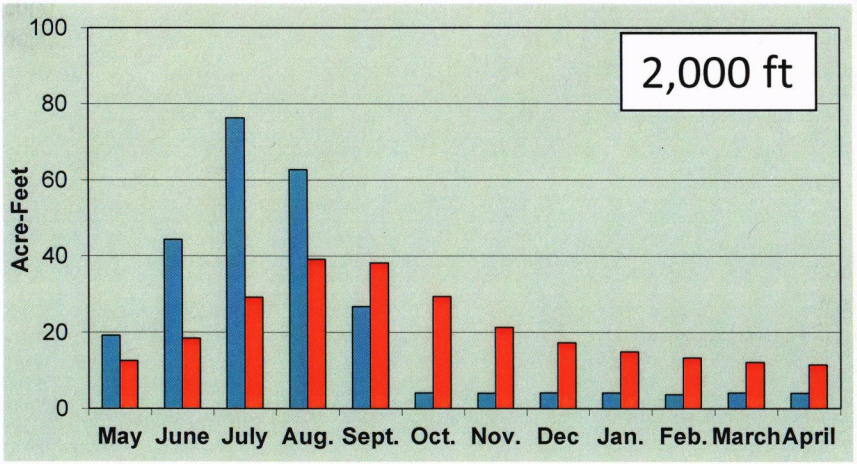
For Option Nos. 1, 2, or 3, do you want to compute ... No

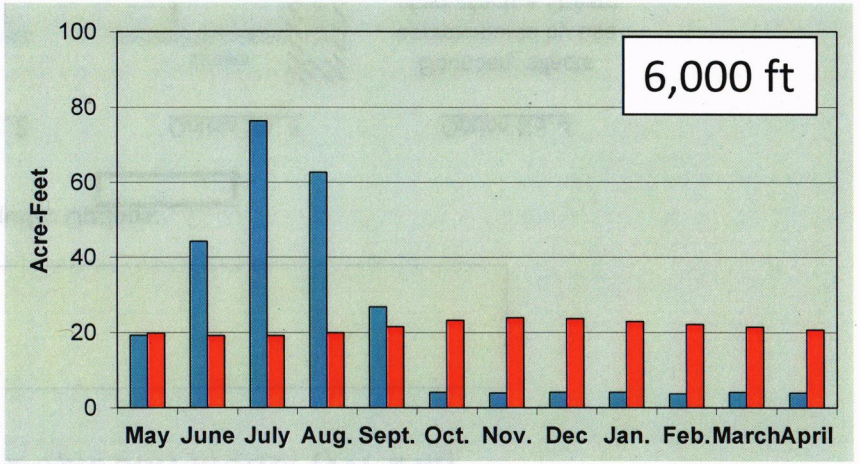
License-Disclaimer | User Guide | Project Data | Pumping Schedule | Graph

http://westernwaterconsulting.com/index.html

Stream Depletion at Different Distances







Consumption
Depletion